CLAIMS:

1. A method of fabricating a porous thin film comprising the steps of:

flowing a precursor gas comprising cyclic siloxane monomers in proximity to a substrate within a PECVD reactor;

adding a mild oxidant into the PECVD reactor, thereby partially oxidizing the cyclic siloxane monomers forming silanol groups;

depositing the silanol groups on the substrate; and

condensing the silanol groups, such that a porous organosilicate glass (OSG) film is formed.

2. The method of claim 1, wherein the step of flowing the precursor gas and the step of adding the mild oxidant are performed simultaneously.

3. The method of claim 1, wherein method further includes the step of subjecting the precursor gas to a plasma in the PECVD reactor.

4. The method of claim 3, wherein the plasma is pulsed and has an RF power density, a duty cycle, and a peak power.

5. The method of claim 4, wherein the RF power density is between about 0.07 W/cm^2 and about 2.6 W/cm^2.

6. The method of claim 4, wherein the peak power is set to between about 200 W and about 500 W.

7. The method of claim 4, wherein the peak power is set to about 400 W.

8. The method of claim 4, wherein the step of setting the duty cycle further includes selecting a percentage of time that peak power is applied that is between about 1% and about 50%.

9. The method of claim 1, wherein method further includes the step of subjecting the precursor gas to a continuous mode plasma in the PECVD reactor.

10. The method of claim 9, wherein the method further includes setting a RF power density to between about 0.07 W/cm^2 and about 2.6 W/cm^2 and setting an input power of the PECVD reactor to between about 40 W to about 500 W.

11. The method of claim 1, wherein the method further includes the step of selecting a monomer to oxidant ratio from between about 1:1 to about 1:100.

12. The method of claim 1, wherein the method further includes the step of selecting a monomer to oxidant ratio from between about 1:5 to about 1:20.

13. The method of claim 1, wherein the step of adding a mild oxidant into the PECVD reactor further comprises selecting a monomer to oxidant ratio such that the film has a desired dielectric constant.

14. The method of claim 13, wherein the monomer to oxidant ratio is selected such that the dielectric constant of the film is less than about 4.

15. The method of claim 13, wherein the monomer to oxidant ratio is selected such that the dielectric constant of the film is less than about 3.

16. The method of claim 13, wherein the monomer to oxidant ratio is selected such that the dielectric constant of the film is less than about 2.9.

17. The method of claim 13, wherein the monomer to oxidant ratio is selected such that the dielectric constant of the film is less than about 2.6.

18. The method of claim 1, wherein the cyclic siloxane monomers further comprise alkyl substituted siloxane molecules.

19. The method of claim 1, wherein the cyclic siloxane monomers can be selected from the group consisting of 1,3,5-trivinyl-1,3,5-trimethylcyclotrisiloxane (V_3D_3), 1,3,5,7-tetramethylcyclotrisiloxane (H_4D_4), 1,1,3,3,5,5-hexamethylcyclotrisiloxane,1,3,5-triethyl-1,3,5-trimethylcyclotrisiloxane, and vinylalkylsiloxanes.

20. The method of claim 1, wherein the cyclic siloxane monomers are 1,3,5-trivinyl-1,3,5-trimethylcyclotrisiloxane (V_3D_3) molecules.

21. The method of claim 1, wherein the step of flowing the precursor gas further comprises setting the flow rate for the cyclic siloxane molecules at between about 1 sccm and 100 sccm.

22. The method of claim 1, wherein the step of flowing the precursor gas further comprises setting the flow rate for the cyclic siloxane molecules at between about 1 sccm and 20 sccm.

23. The method of claim 1, wherein the step of adding a mild oxidant further comprises selecting a mild oxidant from the group consisting of water, primary alcohols, peroxides, and N_2O.

24. The method of claim 1, wherein the step of adding a mild oxidant further comprises adding water.

25. The method of claim 1, wherein the step of adding a mild oxidant further includes setting a flow rate of between about 5 sccm and about 400 sccm.

26. The method of claim 1, wherein the step of adding a mild oxidant further includes setting a flow rate of between about 5 sccm and about 30 sccm.

27. The method of claim 1, wherein the step of condensing the silanol groups further comprises subjecting the substrate to a condition selected from the group consisting of heating, irradiating, or treating in a reactive plasma.

28. The method of claim 1, wherein the step of condensing the silanol groups further comprises heating the substrate to a temperature not higher than about 425°C under inert conditions.

29. The method of claim 28, wherein the step of heating the substrate has a duration of between about 15 minutes to about two hours.

30. The method of claim 1, wherein the step of condensing the silanol groups further comprises heating the substrate to a temperature between about 400°C to about 425°C.

31. The method of claim 1, wherein the step of condensing further comprises condensing under a condition selected from the group consisting of an inert atmosphere, a nitrogen atmosphere, and vacuum conditions.

32. The method of claim 1, wherein the film has at least 90% thickness retention.

33. The method of claim 1, wherein the film has an average connectivity number above a percolation threshold.

34. The method of claim 1, wherein the film has an average connectivity number above about 2.

35. The method of claim 1, wherein the film has an average connectivity number above about 2.2.

36. The method of claim 1, wherein the film has an average connectivity number above about 2.3.

37. An electronic structure having multiple conductor layers comprising at least one low dielectric OSG insulator with a network of nanopores in electrical communication with at least one of the conductor layers, the insulator formed by CVD deposition from an OSG precursor and a mild oxidant.